



RADIO TEST REPORT

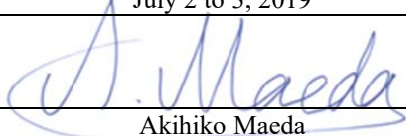
Test Report No. : 12873561H-B

Applicant : TOYOTA MOTOR CORPORATION
Type of Equipment : Smart LF Oscillator
Model No. : TMLF19D-1
FCC ID : NI4TMLF19D-1
Test regulation : FCC Part 15 Subpart C: 2019
Test Result : Complied (Refer to SECTION 3.2)

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
6. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
7. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
8. The information provided from the customer for this report is identified in SECTION 1.

Date of test: July 2 to 3, 2019

Representative test engineer:


Akihiko Maeda
Engineer
Consumer Technology Division

Approved by:


Motoya Imura
Leader
Consumer Technology Division



This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
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http://japan.ul.com/resources/emc_accruited/

- ☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
☒ There is no testing item of "Non-accreditation".

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REVISION HISTORY

Original Test Report No.: 12873561H-B

Revision	Test report No.	Date	Page revised	Contents
- (Original)	12873561H-B	November 13 2019	-	-

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Reference: Abbreviations (Including words undescribed in this report)

A2LA	The American Association for Laboratory Accreditation	MCS	Modulation and Coding Scheme
AC	Alternating Current	MRA	Mutual Recognition Arrangement
AFH	Adaptive Frequency Hopping	N/A	Not Applicable
AM	Amplitude Modulation	NIST	National Institute of Standards and Technology
Amp, AMP	Amplifier	NS	No signal detect.
ANSI	American National Standards Institute	NSA	Normalized Site Attenuation
Ant, ANT	Antenna	NVLAP	National Voluntary Laboratory Accreditation Program
AP	Access Point	OBW	Occupied Band Width
ASK	Amplitude Shift Keying	OFDM	Orthogonal Frequency Division Multiplexing
Atten., ATT	Attenuator	P/M	Power meter
AV	Average	PCB	Printed Circuit Board
BPSK	Binary Phase-Shift Keying	PER	Packet Error Rate
BR	Bluetooth Basic Rate	PHY	Physical Layer
BT	Bluetooth	PK	Peak
BT LE	Bluetooth Low Energy	PN	Pseudo random Noise
BW	BandWidth	PRBS	Pseudo-Random Bit Sequence
Cal Int	Calibration Interval	PSD	Power Spectral Density
CCK	Complementary Code Keying	QAM	Quadrature Amplitude Modulation
Ch., CH	Channel	QP	Quasi-Peak
CISPR	Comite International Special des Perturbations Radioelectriques	QPSK	Quadri-Phase Shift Keying
CW	Continuous Wave	RBW	Resolution Band Width
DBPSK	Differential BPSK	RDS	Radio Data System
DC	Direct Current	RE	Radio Equipment
D-factor	Distance factor	RF	Radio Frequency
DFS	Dynamic Frequency Selection	RMS	Root Mean Square
DQPSK	Differential QPSK	RSS	Radio Standards Specifications
DSSS	Direct Sequence Spread Spectrum	Rx	Receiving
EDR	Enhanced Data Rate	SA, S/A	Spectrum Analyzer
EIRP, e.i.r.p.	Equivalent Isotropically Radiated Power	SG	Signal Generator
EMC	ElectroMagnetic Compatibility	SVSWR	Site-Voltage Standing Wave Ratio
EMI	ElectroMagnetic Interference	TR	Test Receiver
EN	European Norm	Tx	Transmitting
ERP, e.r.p.	Effective Radiated Power	VBW	Video BandWidth
EU	European Union	Vert.	Vertical
EUT	Equipment Under Test	WLAN	Wireless LAN
Fac.	Factor		
FCC	Federal Communications Commission		
FHSS	Frequency Hopping Spread Spectrum		
FM	Frequency Modulation		
Freq.	Frequency		
FSK	Frequency Shift Keying		
GFSK	Gaussian Frequency-Shift Keying		
GNSS	Global Navigation Satellite System		
GPS	Global Positioning System		
Hori.	Horizontal		
ICES	Interference-Causing Equipment Standard		
IEC	International Electrotechnical Commission		
IEEE	Institute of Electrical and Electronics Engineers		
IF	Intermediate Frequency		
ILAC	International Laboratory Accreditation Conference		
ISED	Innovation, Science and Economic Development Canada		
ISO	International Organization for Standardization		
JAB	Japan Accreditation Board		
LAN	Local Area Network		
LIMS	Laboratory Information Management System		

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SECTION 1: Customer information

Company Name	:	TOYOTA MOTOR CORPORATION
Address	:	1, Toyota-Cho, Toyota, Aichi, 471-8572 Japan
Telephone Number	:	+81-565-94-1250
Facsimile Number	:	+81-565-94-0414
Contact Person	:	Hidemasa Yoshida

The information provided from the customer is as follows;

- Applicant, Type of Equipment, Model No. FCC ID on the cover and other relevant pages
- Operating/Test Mode(s) (Mode(s)) on all the relevant pages
- SECTION 1: Customer information
- SECTION 2: Equipment under test (E.U.T.)
- SECTION 4: Operation of E.U.T. during testing

* The laboratory is exempted from liability of any test results affected from the above information in SECTION 2 and 4.

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment	:	Smart LF Oscillator
Model No.	:	TMLF19D-1
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 12.0 V (Max 0.5 A)
Receipt Date of Sample (Information from test lab.)	:	June 28, 2019
Country of Mass-production	:	Japan
Condition of EUT	:	Engineering prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab

2.2 Product Description

Smart LF Oscillator, model: TMLF19D-1 is a transmitter that is installed in a motor vehicle and is used as part of Smart System.

Radio Specification

Radio Type	:	Transmitter
Frequency of Operation	:	134.2 kHz
Modulation	:	ASK
Method of Frequency Generation	:	Crystal (for Outside Antenna, Inside Antenna, Rear Antenna) Ceramic (for Immobilizer Antenna)
Antenna type	:	Ferrite Antenna Coil (for Outside Antenna, Inside Antenna, Rear Antenna) Loop Antenna Coil (for Immobilizer Antenna)

Smart LF Oscillator (model: TMLF19D-1) consists of the following parts:

- Smart ECU
- Immobilizer Antenna
- Inside Antenna
- Outside Antenna
- Rear Antenna

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on July 19, 2019 and effective August 19, 2019 except 15.258

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.209 Radiated emission limits; general requirements.

* The revisions made after testing date do not affect the test specification applied to the EUT.

3.2 Procedures and results

Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
Conducted Emission	<FCC> ANSI C63.10:2013 6 Standard test methods <IC> RSS-Gen 8.8	<FCC> Section 15.207 <IC> RSS-Gen 8.8	-	N/A	N/A *1)	N/A
Electric Field Strength of Fundamental Emission	<FCC> ANSI C63.10:2013 6 Standard test methods <IC> RSS-Gen 6.5, 6.12	<FCC> Section 15.209 <IC> RSS-210 4.4 RSS-Gen 8.9	Radiated	N/A	5.8 dB 0.13420 MHz 0 deg. PK with Duty factor	Complied a)
Electric Field Strength of Spurious Emission	<FCC> ANSI C63.10:2013 6 Standard test methods <IC> RSS-Gen 6.5, 6.6, 6.13	<FCC> Section 15.209 <IC> RSS-210 4.4 RSS-Gen 8.9	Radiated	N/A	15.4 dB 0.67100 MHz, 0 deg., QP	Complied a)
-26dB Bandwidth	<FCC> ANSI C63.10:2013 6 Standard test methods <IC> -	<FCC> Reference data <IC> -	Radiated	N/A	N/A	Complied b)
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. *1) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line. a) Refer to APPENDIX 1 (data of Radiated emission) b) Refer to APPENDIX 1 (data of -26 dB Bandwidth and 99 % Occupied Bandwidth) Symbols: Complied The data of this test item has enough margin, more than the measurement uncertainty. Complied# The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.						

FCC 15.31 (e)

The EUT provides stable voltage constantly to the wireless transmitter regardless of input voltage.
Instead of a new battery, DC power supply was used for the test.
That does not affect the test result, therefore the EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the vehicle. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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3.3 Addition to standard

Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
99 % Occupied Band Width	RSS-Gen 6.7	-	Radiated	N/A	N/A	-

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.

Other than above, no addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

There is no applicable rule of uncertainty in this applied standard. Therefore, the following results are derived depending on whether or not laboratory uncertainty is applied.

The following uncertainties have been calculated to provide a confidence level of 95% using a coverage factor k=2.

Test distance	Radiated emission (+/-)
	9 kHz to 30 MHz
3 m*	3.3 dB
10 m*	3.2 dB

*Measurement distance

Polarity	Radiated emission (Below 1 GHz)			
	(3 m*)(+/-)		(10 m*)(+/-)	
	30 MHz to 200 MHz	200 MHz to 1000 MHz	30 MHz to 200 MHz	200 MHz to 1000 MHz
Horizontal	4.8 dB	5.2 dB	4.8 dB	5.0 dB
Vertical	5.0 dB	6.3 dB	4.9 dB	5.0 dB

* Measurement distance

Bandwidth
0.96 %

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3.5 Test Location

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*NVLAP Lab. code: 200572-0 / FCC Test Firm Registration Number: 199967 / ISED Lab Company Number: 2973C

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Test site	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms	Maximum measurement distance
No.1 semi-anechoic chamber	19.2 x 11.2 x 7.7	7.0 x 6.0	No.1 Power source room	10 m
No.2 semi-anechoic chamber	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber	12.0 x 8.5 x 5.9	6.8 x 5.75	No.3 Preparation room	3 m
No.3 shielded room	4.0 x 6.0 x 2.7	N/A	-	-
No.4 semi-anechoic chamber	12.0 x 8.5 x 5.9	6.8 x 5.75	No.4 Preparation room	3 m
No.4 shielded room	4.0 x 6.0 x 2.7	N/A	-	-
No.5 semi-anechoic chamber	6.0 x 6.0 x 3.9	6.0 x 6.0	-	-
No.5 measurement room	6.4 x 6.4 x 3.0	6.4 x 6.4	-	-
No.6 shielded room	4.0 x 4.5 x 2.7	4.0 x 4.5	-	-
No.6 measurement room	4.75 x 5.4 x 3.0	4.75 x 4.15	-	-
No.7 shielded room	4.7 x 7.5 x 2.7	4.7 x 7.5	-	-
No.8 measurement room	3.1 x 5.0 x 2.7	3.1 x 5.0	-	-
No.9 measurement room	8.8 x 4.6 x 2.8	2.4 x 2.4	-	-
No.11 measurement room	6.2 x 4.7 x 3.0	4.8 x 4.6	-	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0 m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

SECTION 4: Operation of E.U.T. during testing

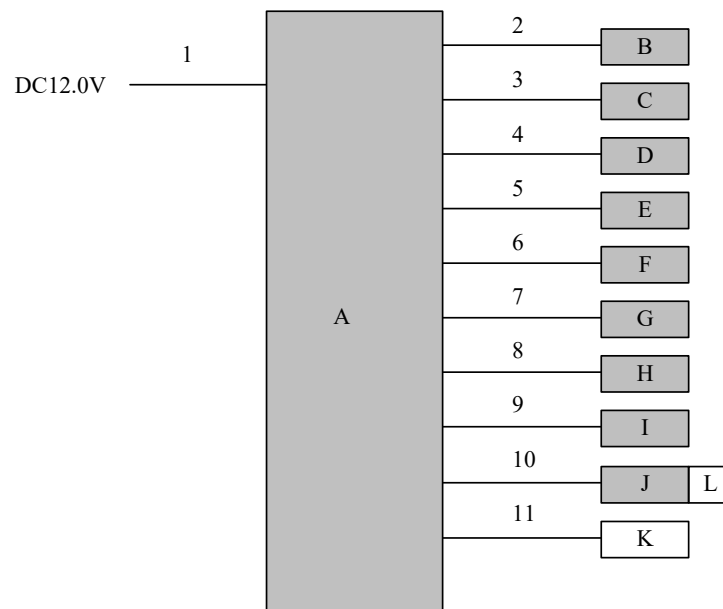
4.1 Operating Modes

Test mode	Remarks *1)
1) Tx 134.2 kHz Outside Antenna	Section 2 of Timing of transmission
2) Tx 134.2 kHz Inside Antenna	Section 2 of Timing of transmission
3) Tx 134.2 kHz Rear Antenna	Section 2 of Timing of transmission
4) Tx 134.2 kHz Immobilizer Antenna	Section 3 of Timing of transmission
5) Tx 134.2 kHz, Outside Antenna 1+2+3+4	Section 1 of Timing of transmission

Justification : The system was configured in typical fashion (as a user would normally use it) for testing.

*1) Refer to Timing of transmission in "Theory of Operation" for details.

4.2 Configuration and peripherals



* Cabling and setup were taken into consideration and test data was taken under worse case conditions.

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Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Smart ECU	TMLF19D-1	E19A2:No.036 *1) E19A2:No.033 *2)	-	EUT
B	Outside Antenna	D19A2	No.043	-	EUT
C	Outside Antenna	D19A2	No.041	-	EUT
D	Outside Antenna	D19A1	No.037	-	EUT
E	Outside Antenna	D19A1	No.039	-	EUT
F	Inside Antenna	18WA0	No.025	-	EUT
G	Inside Antenna	18WA0	No.027	-	EUT
H	Inside Antenna	18WA0	No.026	-	EUT
I	Rear Antenna	12TA0	No.019	-	EUT
J	Immobilizer Antenna	18PA1	No.021	-	EUT
K	Switch BOX	19CY-MAX	No.016	-	-
L	Smart Key	-	No.024	-	-

*1) Used for Mode 1, 2, 3, 4

*2) Used for Mode 5

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	2.0	Unshielded	Unshielded	-
2	Antenna Cable	3.0	Unshielded	Unshielded	-
3	Antenna Cable	3.0	Unshielded	Unshielded	-
4	Antenna Cable	3.0	Unshielded	Unshielded	-
5	Antenna Cable	3.0	Unshielded	Unshielded	-
6	Antenna Cable	3.0	Unshielded	Unshielded	-
7	Antenna Cable	3.0	Unshielded	Unshielded	-
8	Antenna Cable	3.0	Unshielded	Unshielded	-
9	Antenna Cable	3.0	Unshielded	Unshielded	-
10	Antenna Cable	3.0	Unshielded	Unshielded	-
11	Signal Cable	3.0	Unshielded	Unshielded	-

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SECTION 5: Radiated emission (Fundamental and Spurious Emission)

Test Procedure

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

Frequency : From 9 kHz to 30 MHz

The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for vertical polarization (antenna angle: 0 deg., 45 deg., 90 deg., 135 deg. and 180 deg.) and horizontal polarization.

*Refer to Figure 1 about Direction of the Loop Antenna.

Frequency: From 30 MHz to 1 GHz

The measuring antenna height varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for both vertical and horizontal antenna polarization.

The test was made with the detector (RBW / VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

Frequency	Below 30 MHz	30 MHz to 200 MHz	200 MHz to 1 GHz
Antenna Type	Loop	Biconical	Logperiodic

Frequency	From 9 kHz to 90 kHz and From 110 kHz to 150 kHz	From 90 kHz to 110 kHz	From 150 kHz to 490 kHz	From 490 kHz to 30 MHz	From 30 MHz to 1 GHz
Instrument used	Test Receiver				
Detector	PK / AV	QP	PK / AV	QP	QP
IF Bandwidth	200 Hz	200 Hz	9 kHz	9 kHz	120 kHz
Test Distance	3 m *1)	3 m *1)	3 m *1)	3 m *2)	3 m

*1) Distance Factor: $40 \times \log(3 \text{ m} / 300 \text{ m}) = -80 \text{ dB}$

*2) Distance Factor: $40 \times \log(3 \text{ m} / 30 \text{ m}) = -40 \text{ dB}$

Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open field test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

These tests were performed in semi anechoic chamber. Therefore the measured level of emissions may be higher than if measurements were made without a ground plane.

However test results were confirmed to pass against standard limit.

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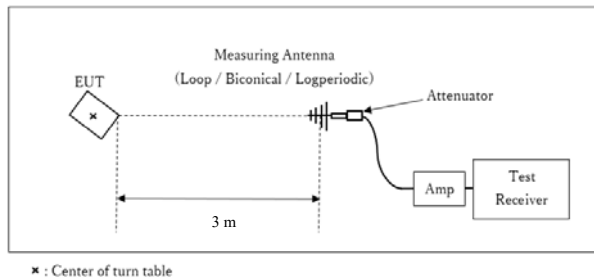
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[Test Setup]
Below 1 GHz



Test Distance: 3 m

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

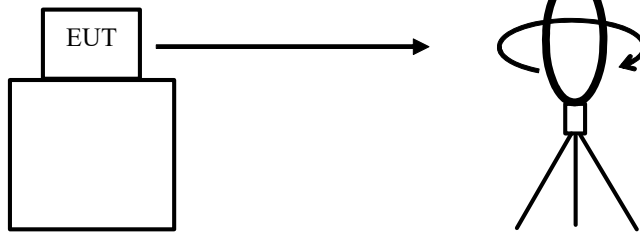
Measurement range : 9 kHz - 1 GHz
Test data : APPENDIX 1
Test result : Pass

Date: July 2, 2019
July 3, 2019 (day)
July 3, 2019 (night)

Test engineer: Akihiko Maeda
Junya Okuno
Akihiko Maeda

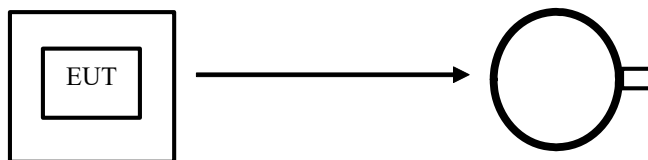
Figure 1: Direction of the Loop Antenna

Side View (Vertical)



.....

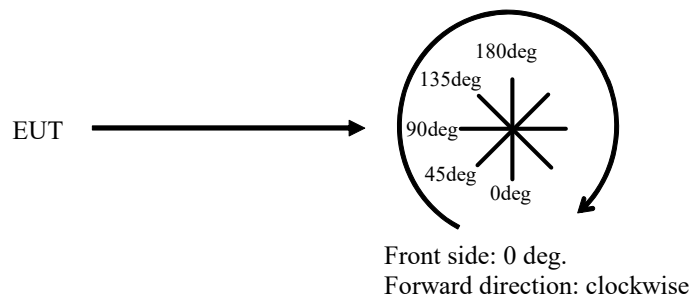
Top View (Horizontal)



Antenna was not rotated.

.....

Top View (Vertical)



SECTION 6: -26dB Bandwidth

Test Procedure

The test was measured with a spectrum analyzer using a test fixture.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
-26 dB Bandwidth	50 kHz	510 Hz	1.6 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

Test data : APPENDIX 1
Test result : Pass

SECTION 7: 99% Occupied Bandwidth

Test Procedure

The test was measured with a spectrum analyzer using a test fixture.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
99 % Occupied Bandwidth	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak *1)	Max Hold *1)	Spectrum Analyzer
*1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100 %. Peak hold was applied as Worst-case measurement.							

Test data : APPENDIX 1
Test result : Pass

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APPENDIX 1: Test data

Radiated Emission below 30 MHz (Fundamental and Spurious Emission)

Report No. 12873561H
Test place Ise EMC Lab. No.1 Semi Anechoic Chamber
Date 07/02/2019
Temperature/ Humidity 24 deg. C / 73 % RH
Engineer Akihiko Maeda
Mode Tx 134.2 kHz, Outside Antenna

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.13420	PK	102.9	19.7	-74.0	32.2	-	16.4	45.0	28.6	Fundamental
0	0.26840	PK	59.3	19.7	-74.0	32.2	-	-27.2	39.0	66.2	
0	0.40260	PK	66.7	19.6	-73.9	32.2	-	-19.8	35.5	55.3	
0	0.53680	QP	36.3	19.6	-33.9	32.1	-	-10.1	33.0	43.1	
0	0.67100	QP	56.1	19.6	-33.9	32.2	-	9.7	31.1	21.4	
0	0.80520	QP	32.7	19.6	-33.9	32.2	-	-13.7	29.5	43.2	
0	0.93940	QP	46.6	19.6	-33.8	32.2	-	0.2	28.1	27.9	
0	1.07360	QP	31.5	19.6	-33.8	32.2	-	-14.9	26.9	41.8	
0	1.20780	QP	38.5	19.6	-33.8	32.2	-	-7.9	25.9	33.8	
0	1.34200	QP	31.2	19.6	-33.8	32.2	-	-15.2	25.0	40.2	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + D.Factor) - Gain(Amplifier)

PK with Duty factor

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.13420	AV	102.9	19.7	-74.0	32.2	0.0	16.4	25.0	8.6	
0	0.26840	AV	59.3	19.7	-74.0	32.2	0.0	-27.2	19.0	46.2	
0	0.40260	AV	66.7	19.6	-73.9	32.2	0.0	-19.8	15.5	35.3	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + D.Factor) - Gain(Amplifier) + Duty factor *

* Since the peak emission result satisfied the average limit, duty factor was omitted.

Result of the fundamental emission at 3m without Distance factor

PK or QP

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.13420	PK	102.9	19.7	6.0	32.2	-	96.4	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amplifier)

* Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

*The test result is rounded off to one or two decimal places, so some differences might be observed.

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Ise EMC Lab.

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Radiated Emission below 30 MHz (Fundamental and Spurious Emission)

Report No. 12873561H
Test place Ise EMC Lab. No.1 Semi Anechoic Chamber
Date 07/02/2019
Temperature/ Humidity 24 deg. C / 73 % RH
Engineer Akihiko Maeda
Mode Tx 134.2 kHz, Inside Antenna

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.13420	PK	102.1	19.7	-74.0	32.2	-	15.6	45.0	29.4	Fundamental
0	0.26840	PK	58.5	19.7	-74.0	32.2	-	-28.0	39.0	67.0	
0	0.40260	PK	68.1	19.6	-73.9	32.2	-	-18.4	35.5	53.9	
0	0.53680	QP	45.0	19.6	-33.9	32.1	-	-1.4	33.0	34.4	
0	0.67100	QP	59.1	19.6	-33.9	32.2	-	12.7	31.1	18.4	
0	0.80520	QP	32.1	19.6	-33.9	32.2	-	-14.3	29.5	43.8	
0	0.93940	QP	50.6	19.6	-33.8	32.2	-	4.2	28.1	23.9	
0	1.07360	QP	31.0	19.6	-33.8	32.2	-	-15.4	26.9	42.3	
0	1.20780	QP	41.9	19.6	-33.8	32.2	-	-4.5	25.9	30.4	
0	1.34200	QP	30.9	19.6	-33.8	32.2	-	-15.5	25.0	40.5	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + D.Factor) - Gain(Amplifier)

PK with Duty factor

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.13420	AV	102.1	19.7	-74.0	32.2	0.0	15.6	25.0	9.4	
0	0.26840	AV	58.5	19.7	-74.0	32.2	0.0	-28.0	19.0	47.0	
0	0.40260	AV	68.1	19.6	-73.9	32.2	0.0	-18.4	15.5	33.9	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + D.Factor) - Gain(Amplifier) + Duty factor *

* Since the peak emission result satisfied the average limit, duty factor was omitted.

Result of the fundamental emission at 3m without Distance factor

PK or QP

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.13420	PK	102.1	19.7	6.0	32.2	-	95.6	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amplifier)

* Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

*The test result is rounded off to one or two decimal places, so some differences might be observed.

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Radiated Emission below 30 MHz (Fundamental and Spurious Emission)

Report No. 12873561H
Test place Ise EMC Lab. No.1 Semi Anechoic Chamber
Date 07/02/2019
Temperature/ Humidity 24 deg. C / 73 % RH
Engineer Akihiko Maeda
Mode Tx 134.2 kHz, Rear Antenna

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.13420	PK	101.8	19.7	-74.0	32.2	-	15.3	45.0	29.7	Fundamental
0	0.26840	PK	58.3	19.7	-74.0	32.2	-	-28.2	39.0	67.2	
0	0.40260	PK	61.2	19.6	-73.9	32.2	-	-25.3	35.5	60.8	
0	0.53680	QP	55.1	19.6	-33.9	32.1	-	8.7	33.0	24.3	
0	0.67100	QP	50.8	19.6	-33.9	32.2	-	4.4	31.1	26.7	
0	0.80520	QP	31.8	19.6	-33.9	32.2	-	-14.6	29.5	44.1	
0	0.93940	QP	48.2	19.6	-33.8	32.2	-	1.8	28.1	26.3	
0	1.07360	QP	31.0	19.6	-33.8	32.2	-	-15.4	26.9	42.3	
0	1.20780	QP	44.0	19.6	-33.8	32.2	-	-2.4	25.9	28.3	
0	1.34200	QP	30.9	19.6	-33.8	32.2	-	-15.5	25.0	40.5	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + D.Factor) - Gain(Amplifier)

PK with Duty factor

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.13420	AV	101.8	19.7	-74.0	32.2	0.0	15.3	25.0	9.7	
0	0.26840	AV	58.3	19.7	-74.0	32.2	0.0	-28.2	19.0	47.2	
0	0.40260	AV	61.2	19.6	-73.9	32.2	0.0	-25.3	15.5	40.8	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + D.Factor) - Gain(Amplifier) + Duty factor *

* Since the peak emission result satisfied the average limit, duty factor was omitted.

Result of the fundamental emission at 3m without Distance factor

PK or QP

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.13420	PK	101.8	19.7	6.0	32.2	-	95.3	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amplifier)

* Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

*The test result is rounded off to one or two decimal places, so some differences might be observed.

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Radiated Emission below 30 MHz (Fundamental and Spurious Emission)

Report No. 12873561H
Test place Ise EMC Lab. No.1 Semi Anechoic Chamber
Date 07/02/2019
Temperature/ Humidity 24 deg. C / 73 % RH
Engineer Akihiko Maeda
Mode Tx 134.2 kHz, Immobilizer Antenna

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.13420	PK	95.5	19.7	-74.0	32.2	-	9.0	45.0	36.0	Fundamental
0	0.26840	PK	47.9	19.7	-74.0	32.2	-	-38.6	39.0	77.6	
0	0.40260	PK	59.5	19.6	-73.9	32.2	-	-27.0	35.5	62.5	
0	0.53680	QP	32.8	19.6	-33.9	32.1	-	-13.6	33.0	46.6	
0	0.67100	QP	49.0	19.6	-33.9	32.2	-	2.6	31.1	28.5	
0	0.80520	QP	31.6	19.6	-33.9	32.2	-	-14.8	29.5	44.3	
0	0.93940	QP	41.9	19.6	-33.8	32.2	-	-4.5	28.1	32.6	
0	1.07360	QP	37.2	19.6	-33.8	32.2	-	-9.2	26.9	36.1	
0	1.20780	QP	36.9	19.6	-33.8	32.2	-	-9.5	25.9	35.4	
0	1.34200	QP	31.3	19.6	-33.8	32.2	-	-15.1	25.0	40.1	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + D.Factor) - Gain(Amplifier)

PK with Duty factor

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.13420	AV	95.5	19.7	-74.0	32.2	0.0	9.0	25.0	16.0	
0	0.26840	AV	47.9	19.7	-74.0	32.2	0.0	-38.6	19.0	57.6	
0	0.40260	AV	59.5	19.6	-73.9	32.2	0.0	-27.0	15.5	42.5	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + D.Factor) - Gain(Amplifier) + Duty factor *

* Since the peak emission result satisfied the average limit, duty factor was omitted.

Result of the fundamental emission at 3m without Distance factor

PK or QP

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.13420	PK	95.5	19.7	6.0	32.2	-	89.0	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amplifier)

* Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

*The test result is rounded off to one or two decimal places, so some differences might be observed.

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Radiated Emission below 30 MHz (Fundamental and Spurious Emission)

Report No. 12873561H
Test place Ise EMC Lab. No.1 Semi Anechoic Chamber
Date 07/02/2019
Temperature/ Humidity 24 deg. C / 73 % RH
Engineer Akihiko Maeda
Mode Tx 134.2 kHz, Outside Antenna 1+2+3+4

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.13420	PK	105.7	19.7	-74.0	32.2	-	19.2	45.0	25.8	Fundamental
0	0.26840	PK	53.9	19.7	-64.3	32.2	-	-22.9	39.0	61.9	
0	0.40260	PK	67.8	19.6	-64.3	32.2	-	-9.0	35.5	44.5	
0	0.53680	QP	32.4	19.6	-24.3	32.1	-	-4.4	33.0	37.4	
0	0.67100	QP	52.5	19.6	-24.3	32.2	-	15.7	31.1	15.4	
0	0.80520	QP	28.8	19.6	-24.2	32.2	-	-8.0	29.5	37.5	
0	0.93940	QP	42.6	19.6	-24.2	32.2	-	5.8	28.1	22.3	
0	1.07360	QP	25.5	19.6	-24.2	32.2	-	-11.3	26.9	38.2	
0	1.20780	QP	33.6	19.6	-24.2	32.2	-	-3.2	25.9	29.1	
0	1.34200	QP	23.5	19.6	-24.2	32.2	-	-13.2	25.0	38.2	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + D.Factor) - Gain(Amplifier)

PK with Duty factor

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.13420	AV	105.7	19.7	-74.0	32.2	0.0	19.2	25.0	5.8	
0	0.26840	AV	53.9	19.7	-64.3	32.2	0.0	-22.9	19.0	41.9	
0	0.40260	AV	67.8	19.6	-64.3	32.2	0.0	-9.0	15.5	24.5	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + D.Factor) - Gain(Amplifier) + Duty factor *

* Since the peak emission result satisfied the average limit, duty factor was omitted.

Result of the fundamental emission at 3m without Distance factor

PK or QP

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.13420	PK	105.7	19.7	6.0	32.2	-	99.2	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amplifier)

* Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

*The test result is rounded off to one or two decimal places, so some differences might be observed.

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Radiated Emission above 30 MHz (Spurious Emission)

Report No. 12873561H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date 07/03/2019
Temperature / Humidity 22 deg. C / 68% RH
Engineer Junya Okuno
(Above 30MHz)
Mode Tx 134.2 kHz, Outside Antenna

Pola. [H/V]	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
H	35.076	QP	36.1	15.8	7.5	38.9	20.5	40.0	19.5	
H	77.299	QP	32.3	6.3	8.3	39.0	7.8	40.0	32.2	
H	88.776	QP	28.4	7.9	8.4	39.1	5.7	43.5	37.8	
H	352.530	QP	27.6	15.1	11.2	38.8	15.1	46.0	30.9	
H	601.509	QP	26.6	19.5	12.9	38.4	20.6	46.0	25.4	
H	939.581	QP	26.4	22.1	14.9	38.1	25.2	46.0	20.8	
V	34.355	QP	37.9	16.1	7.5	38.9	22.5	40.0	17.5	
V	77.295	QP	34.6	6.3	8.3	39.0	10.1	40.0	29.9	
V	88.789	QP	29.0	7.9	8.4	39.1	6.3	43.5	37.2	
V	352.530	QP	27.6	15.1	11.2	38.8	15.1	46.0	30.9	
V	601.509	QP	26.6	19.5	12.9	38.4	20.6	46.0	25.4	
V	939.581	QP	26.4	22.1	14.9	38.1	25.2	46.0	20.8	

CHART: WITH FACTOR

ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE + ATT) - GAIN(AMP)

*The test result is rounded off to one or two decimal places, so some differences might be observed.

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Radiated Emission above 30 MHz (Spurious Emission)

Report No. 12873561H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date 07/03/2019
Temperature / Humidity 22 deg. C / 68% RH
Engineer Junya Okuno
(Above 30MHz)
Mode Tx 134.2 kHz, Inside Antenna

Pola. [H/V]	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
H	62.202	QP	29.2	6.8	8.0	39.0	5.0	40.0	35.0	
H	77.299	QP	36.7	6.3	8.3	39.0	12.2	40.0	27.8	
H	91.249	QP	34.0	8.3	8.5	39.1	11.7	43.5	31.8	
H	352.530	QP	27.7	15.1	11.2	38.8	15.2	46.0	30.8	
H	601.509	QP	27.2	19.5	12.9	38.4	21.2	46.0	24.8	
H	939.581	QP	26.4	22.1	14.9	38.1	25.2	46.0	20.8	
V	62.201	QP	34.9	6.8	8.0	39.0	10.7	40.0	29.3	
V	77.276	QP	37.7	6.3	8.3	39.0	13.2	40.0	26.8	
V	91.205	QP	33.6	8.3	8.5	39.1	11.3	43.5	32.2	
V	352.530	QP	27.6	15.1	11.2	38.8	15.1	46.0	30.9	
V	601.509	QP	26.6	19.5	12.9	38.4	20.6	46.0	25.4	
V	939.581	QP	26.4	22.1	14.9	38.1	25.2	46.0	20.8	

CHART: WITH FACTOR

ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE + ATT) - GAIN(AMP)

*The test result is rounded off to one or two decimal places, so some differences might be observed.

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Radiated Emission above 30 MHz (Spurious Emission)

Report No. 12873561H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date 07/03/2019
Temperature / Humidity 22 deg. C / 68% RH
Engineer Junya Okuno
(Above 30MHz)
Mode Tx 134.2 kHz, Rear Antenna

Pola. [H/V]	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
H	60.792	QP	28.6	7.2	8.0	39.0	4.8	40.0	35.2	
H	73.005	QP	32.9	6.1	8.2	39.0	8.2	40.0	31.8	
H	90.182	QP	34.4	8.2	8.5	39.1	12.0	43.5	31.5	
H	352.530	QP	27.7	15.1	11.2	38.8	15.2	46.0	30.8	
H	601.509	QP	27.2	19.5	12.9	38.4	21.2	46.0	24.8	
H	939.581	QP	26.4	22.1	14.9	38.1	25.2	46.0	20.8	
V	60.836	QP	36.7	7.2	8.0	39.0	12.9	40.0	27.1	
V	73.005	QP	34.9	6.1	8.2	39.0	10.2	40.0	29.8	
V	90.182	QP	34.0	8.2	8.5	39.1	11.6	43.5	31.9	
V	352.530	QP	27.6	15.1	11.2	38.8	15.1	46.0	30.9	
V	601.509	QP	26.6	19.5	12.9	38.4	20.6	46.0	25.4	
V	939.581	QP	26.4	22.1	14.9	38.1	25.2	46.0	20.8	

CHART: WITH FACTOR

ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE + ATT) - GAIN(AMP)

*The test result is rounded off to one or two decimal places, so some differences might be observed.

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Radiated Emission above 30 MHz (Spurious Emission)

Report No. 12873561H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date 07/03/2019
Temperature / Humidity 22 deg. C / 68% RH
Engineer Junya Okuno
(Above 30MHz)
Mode Tx 134.2 kHz, Immobilizer Antenna

Pola. [H/V]	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
H	62.198	QP	29.1	6.8	8.0	39.0	4.9	40.0	35.1	
H	89.401	QP	32.7	8.1	8.4	39.1	10.2	43.5	33.3	
H	184.162	QP	28.1	15.8	9.6	39.1	14.5	43.5	29.1	
H	352.530	QP	27.7	15.1	11.2	38.8	15.2	46.0	30.8	
H	601.509	QP	27.2	19.5	12.9	38.4	21.2	46.0	24.8	
H	939.581	QP	26.4	22.1	14.9	38.1	25.2	46.0	20.8	
V	62.220	QP	34.7	6.8	8.0	39.0	10.5	40.0	29.5	
V	83.197	QP	28.8	6.9	8.4	39.0	5.1	40.0	35.0	
V	184.158	QP	28.0	15.8	9.6	39.1	14.4	43.5	29.2	
V	352.530	QP	27.6	15.1	11.2	38.8	15.1	46.0	30.9	
V	601.509	QP	26.6	19.5	12.9	38.4	20.6	46.0	25.4	
V	939.581	QP	26.4	22.1	14.9	38.1	25.2	46.0	20.8	

CHART: WITH FACTOR

ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN

CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE + ATT) - GAIN(AMP)

*The test result is rounded off to one or two decimal places, so some differences might be observed.

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Radiated Emission above 30 MHz (Spurious Emission)

Report No. 12873561H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date 07/03/2019
Temperature / Humidity 24 deg. C / 68% RH
Engineer Akihiko Maeda
(Above 30MHz)
Mode Tx 134.2 kHz, Outside Antenna 1+2+3+4

Pola. [H/V]	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
H	33.956	QP	32.5	16.2	7.5	38.9	17.2	40.0	22.8	
H	49.162	QP	35.1	10.9	7.8	38.9	14.8	40.0	25.2	
H	66.113	QP	28.8	6.2	8.1	39.0	4.1	40.0	35.9	
H	77.302	QP	32.2	6.3	8.3	39.0	7.7	40.0	32.3	
H	85.890	QP	34.0	7.4	8.4	39.0	10.8	40.0	29.2	
H	90.767	QP	31.7	8.2	8.5	39.1	9.3	43.5	34.2	
V	33.956	QP	33.0	16.2	7.5	38.9	17.7	40.0	22.3	
V	49.162	QP	38.5	10.9	7.8	38.9	18.2	40.0	21.8	
V	66.113	QP	34.4	6.2	8.1	39.0	9.7	40.0	30.3	
V	77.302	QP	34.7	6.3	8.3	39.0	10.2	40.0	29.8	
V	85.890	QP	33.5	7.4	8.4	39.0	10.3	40.0	29.7	
V	90.767	QP	34.5	8.2	8.5	39.1	12.1	43.5	31.4	

CHART: WITH FACTOR

ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE + ATT) - GAIN(AMP)

*The test result is rounded off to one or two decimal places, so some differences might be observed.

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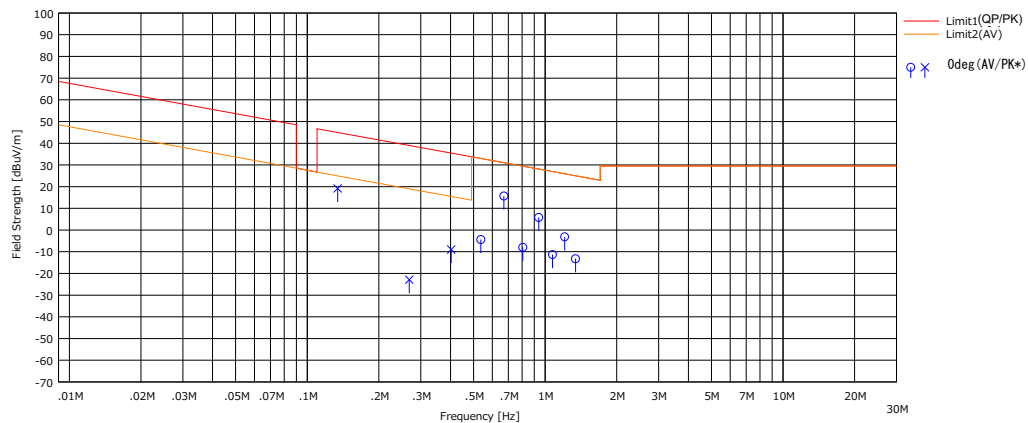
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Radiated Emission Plot data, Worst case

Report No.	12873561H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.1	No.1
Date	07/02/2019	07/03/2019
Temperature / Humidity	24 deg. C / 73% RH	24 deg. C / 68% RH
Engineer	Akihiko Maeda	Akihiko Maeda
	(Below 30MHz)	(Above 30MHz)
Mode	Tx 134.2 kHz, Outside Antenna 1+2+3+4	

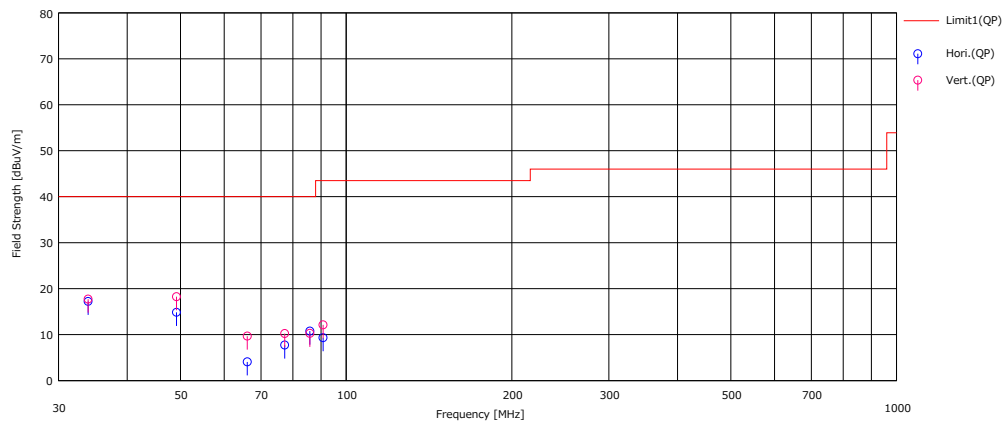
(below 30MHz)

Limit : FCC15.209(a), 9-90kHz:PK, 110-490kHz:PK, other:QP



* Data above 490 kHz were measured using a QP detector.

(above 30MHz)



*These plots data contains sufficient number to show the trend of characteristic features for EUT.

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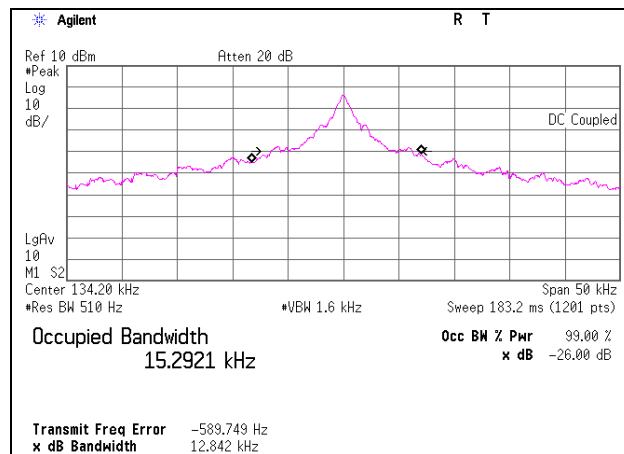
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-26 dB Bandwidth and 99 % Occupied Bandwidth

Report No. 12873561H
Test place Ise EMC Lab. No.1 Semi Anechoic Chamber
Date 07/02/2019
Temperature/ Humidity 24 deg. C / 73 % RH
Engineer Akihiko Maeda
Mode Tx 134.2 kHz, Outside Antenna

-26 dB Bandwidth [kHz]	99 % Occupied Bandwidth [kHz]
12.842	15.2921



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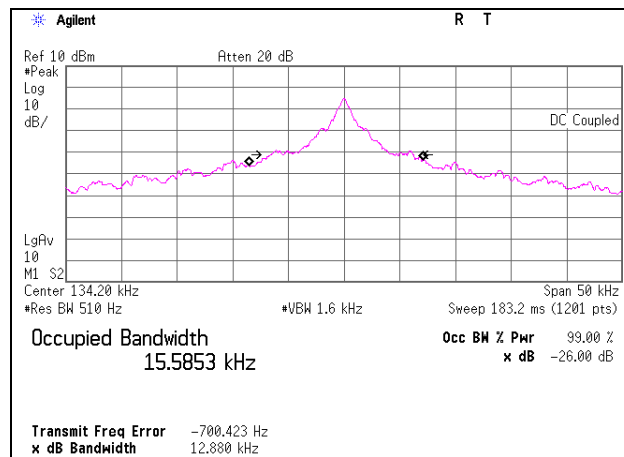
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Facsimile : +81 596 24 8124

-26 dB Bandwidth and 99 % Occupied Bandwidth

Report No. 12873561H
Test place Ise EMC Lab. No.1 Semi Anechoic Chamber
Date 07/02/2019
Temperature/ Humidity 24 deg. C / 73 % RH
Engineer Akihiko Maeda
Mode Tx 134.2 kHz, Inside Antenna

-26 dB Bandwidth [kHz]	99 % Occupied Bandwidth [kHz]
12.880	15.5853



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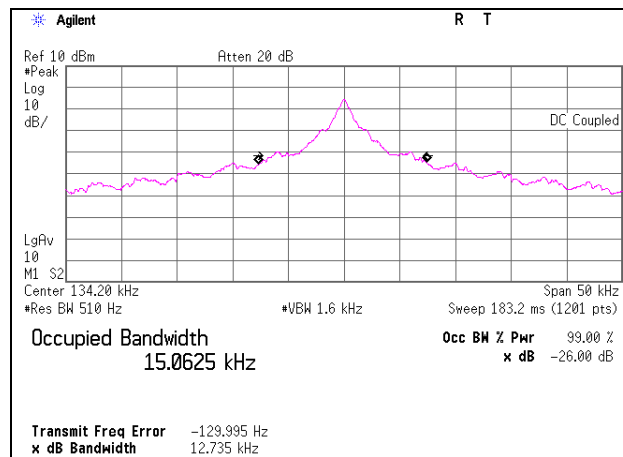
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Facsimile : +81 596 24 8124

-26 dB Bandwidth and 99 % Occupied Bandwidth

Report No. 12873561H
Test place Ise EMC Lab. No.1 Semi Anechoic Chamber
Date 07/02/2019
Temperature/ Humidity 24 deg. C / 73 % RH
Engineer Akihiko Maeda
Mode Tx 134.2 kHz, Rear Antenna

-26 dB Bandwidth [kHz]	99 % Occupied Bandwidth [kHz]
12.735	15.0625



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-26 dB Bandwidth and 99 % Occupied Bandwidth

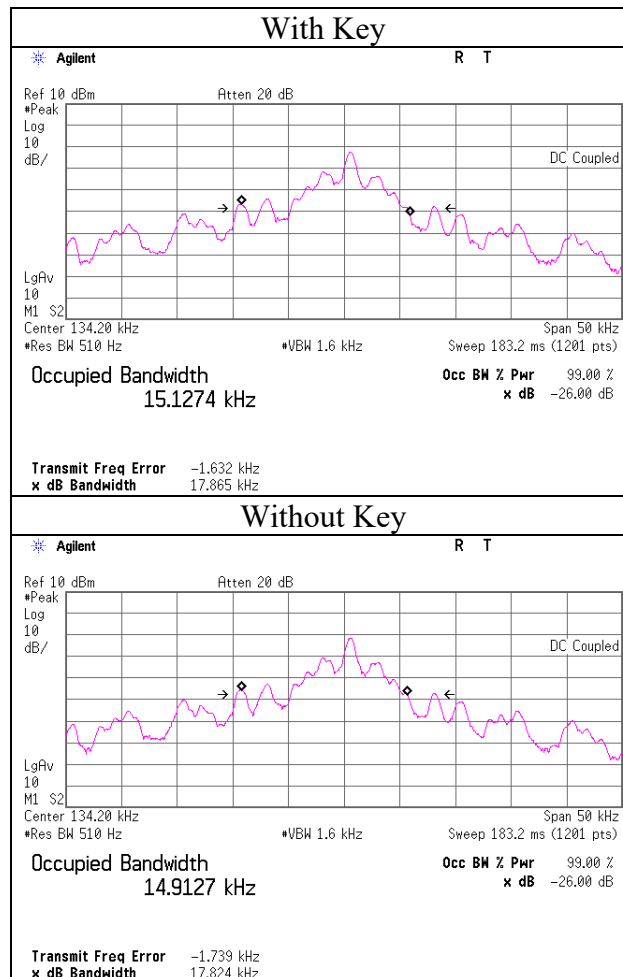
Report No.	12873561H
Test place	Ise EMC Lab. No.1 Semi Anechoic Chamber
Date	07/02/2019
Temperature/ Humidity	24 deg. C / 73 % RH
Engineer	Akihiko Maeda
Mode	Tx 134.2 kHz, Immobilizer Antenna

With Key

-26 dB Bandwidth [kHz]	99 % Occupied Bandwidth [kHz]
17.865	15.1274

Without Key

-26 dB Bandwidth [kHz]	99 % Occupied Bandwidth [kHz]
17.824	14.9127



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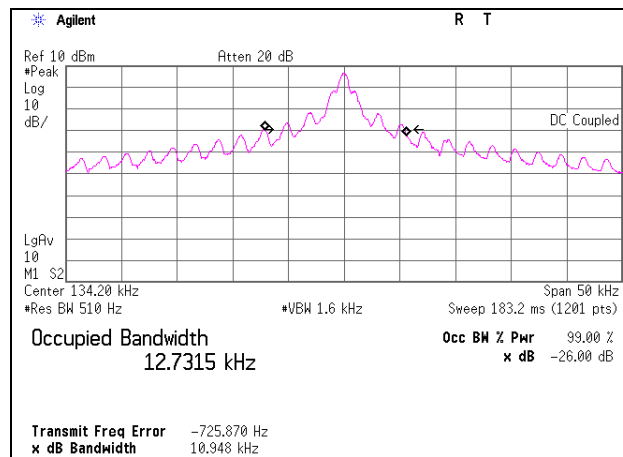
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-26 dB Bandwidth and 99 % Occupied Bandwidth

Report No. 12873561H
Test place Ise EMC Lab. No.1 Semi Anechoic Chamber
Date 07/02/2019
Temperature/ Humidity 24 deg. C / 73 % RH
Engineer Akihiko Maeda
Mode Tx 134.2 kHz, Outside Antenna 1+2+3+4

-26 dB Bandwidth [kHz]	99 % Occupied Bandwidth [kHz]
10.948	12.7315



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APPENDIX 2: Test instruments

Test Instruments

Test item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
RE	141566	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q26	01/11/2019	01/31/2020	12
RE	141350	Coaxial Cable	Suhner/storm/Agilent/TSJ	-	-	06/27/2019	06/30/2020	12
RE	141264	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-189	03/21/2019	03/31/2020	12
RE	141198	Biconical Antenna	Schwarzbeck	BBA9106	2513	04/12/2019	04/30/2020	12
RE	141583	Pre Amplifier	SONOMA INSTRUMENT	310	260833	02/08/2019	02/29/2020	12
RE	141295	High Pass Filter 0.15-30MHz	Rohde & Schwarz	EZ-25/3	100041	02/07/2019	02/29/2020	12
RE	141213	Attenuator(6dB)	Weinschel Corp	2	BK7971	11/05/2018	11/30/2019	12
RE	141998	AC1 Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	06/18/2018	06/30/2020	24
RE	178648	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
RE	142226	Measure	KOMELON	KMC-36	-	-	-	-
RE	141585	Pre Amplifier	MITEQ	MLA-10K01-B01-35	1237616	02/08/2019	02/29/2020	12
RE	141950	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	06/27/2019	06/30/2020	12
RE	141215	Coaxial Cable	Fujikura/Suhner/TSJ	5D-2W/3D-2W/ RG400u/ RFM-E421(SW)	-/01068 (Switcher)	06/27/2019	06/30/2020	12
RE	141254	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	10/11/2018	10/31/2019	12
RE	141413	Coaxial Cable	UL Japan	-	-	06/07/2019	06/30/2020	12

*Hyphens for Last Calibration Date, Calibration Due Date and Cal Int (month) are instruments that Calibration is not required (e.g. software), or instruments checked in advance before use.

The expiration date of the calibration is the end of the expired month.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

Test item:

RE: Spurious emission

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